# POPULAR MECHANICS

An Illustrated Weekly Review of the Mechanical Press of the World

"Tells you how to do things" Written so you can understand it

Smithsonian Institution

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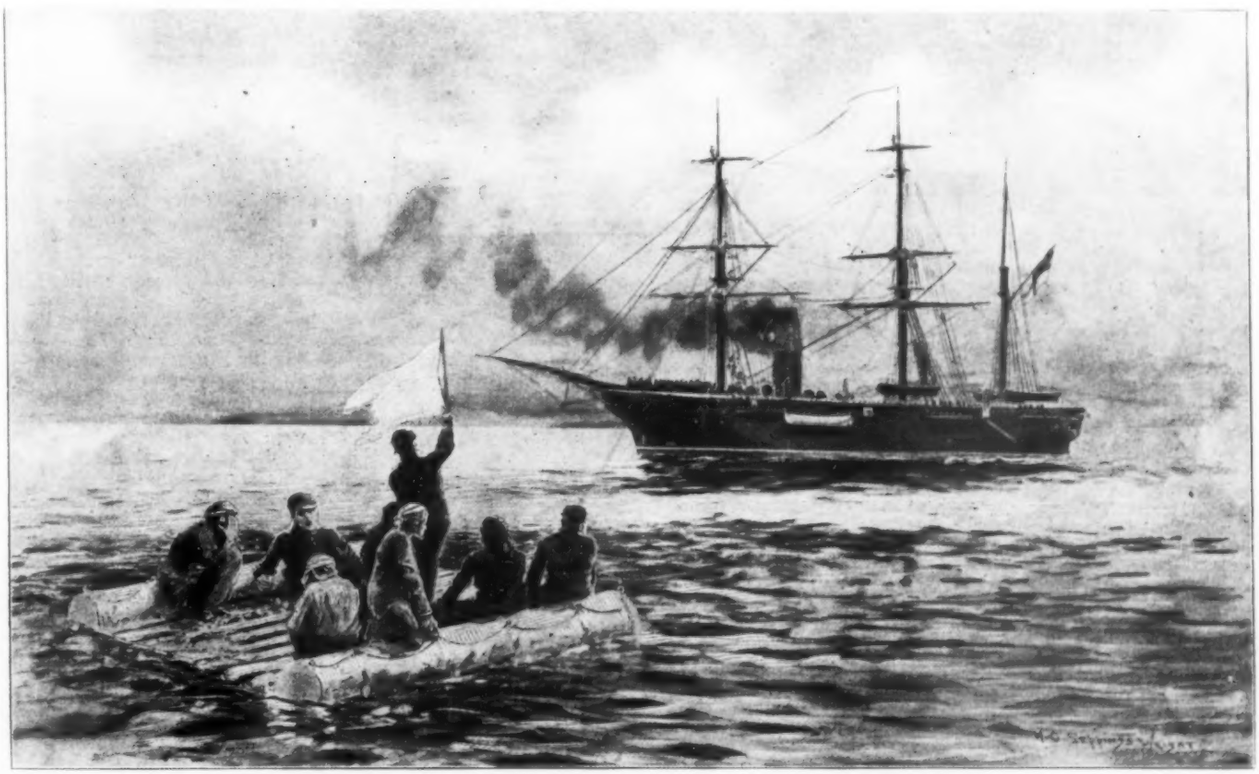
# The End of a Tale of Horror



**Survivors of the Elingamite Spend Four Days on a Frail Raft With No Water and but Two Apples Between Them**

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## EIGHT LIVE FOUR DAYS ON TWO APPLES.

**People Die and Go Mad During Awful Experiences of the Shipwrecked Passengers of the "Elingamite."**

Two apples for eight persons on a journey of 66 miles lasting four days, is scanty rations, but the survivors of the British steamship "Elingamite," which went down in twenty minutes off one of the Three King's Islands north of New Zealand, did not have even this. The survivors who numbered sixteen persons including one woman were huddled together on a small raft, and the two apples was all the food they had to divide among themselves. Besides this they did not have a drop of water. On the awful voyage three of the sixteen went mad and jumped overboard, and five died, including the woman, who was the stewardess. The raft was followed throughout the perilous days by ravenous sharks which devoured the bodies of the dead as fast as they were cast overboard. It was a joyous moment when the eight that remained of the 16 original survivors sighted His Majesty's Ship Penguin at four o'clock on the fourth day of the horrible voyage. The illustration which is drawn from a description minutely furnished by one of the survivors shows the raft's crew signalling the "Penguin" by waving a shirt.

## AUTOMOBILE TRAINS IN LONDON.

**Northeastern Railroad Building the Cars for Its New Motor Service.**

The London Times again comments on the "automobile trains," mentioned in a recent issue of Popular Mechanics, that are soon to be started in London and Paris. Relative to the cars to be used on the Northeastern railway, the Times states:

"Each car will carry a complete apparatus for generating its own motive power. At one end of the car there will be a Napier petrol engine of 85-brake horse-power, with 4 cylinders. The engine will drive a dyanmo, generating electricity for 2 motors, which will apply the power to the wheels of the "bogie" underneath the engine compartment. Two of these 4-wheeled "bogies," of practically the normal railway-carriage type, will carry the framework of the car, but the body will be much lighter than that of an ordinary carriage, approaching closely to the tram type. In fact, the vehicle will be a tram saloon, with an engine compartment at one end and a conductor's compartment at the other. Seating accommodation will be provided in each car for 52 passengers; and, as storage is provided for 30 gallons of petrol, it is anticipated that the automobile will be able to work five hours at a stretch without replenishing. It is calculated that by this system a speed of 30 miles an hour can be got up in as many seconds, which is a very much quicker acceleration than is possible with an ordinary train. It is not proposed to use these auto cars at first for the longer distance traffic of the Northeastern Railway, but to employ them rather for accelerating the service on those sections of the system where an ordinary train can only make a slow rate of speed, owing to the number of stopping places."

## IDENTIFIED BY A PICTURE MACHINE.

**Mutascope Rescues Sir Hiram Maxim from a Humiliating Position.**

The unique value of the mutascope as a recorder of living events was demonstrated during a recent visit of Sir Hiram Maxim to a Southern watering place. The story as told by Sir Hiram, himself, is that at the conclusion of his visit he presented a check to the hotel proprietor in discharge of his hotel bill.

Hotel proprietors do not like checks from strangers, and generally make it a rule not to accept them. So Sir Hiram was politely informed that only cash could be taken in payment. "You see," said the proprietor, "I do not know that you really are Sir Hiram Maxim."

The famous inventor readily recognized the force of the argument, but said he had not sufficient money in his pocket to discharge the debt. It might have been an awkward position but for a happy thought that occurred to Lady Maxim.

She asked the proprietor to go on the pier, put a penny in the slot of a mutascope, turn the handle, and he would then see a "living" picture of Sir Hiram firing a Maxim gun in the presence of the Shah of Persia. The hotel proprietor acted on this advice, and on returning admitted that the distinguished visitor was really Sir Hiram Maxim, and accepted the check with profuse apologies.

## SHORTCOMINGS OF THE BRITISH EMPIRE.

**Subject Sees Woes Ahead in the Want of Fast Steamers and in Other Inadequacies.**

Here are a few impending perils confronting the British Empire contained in a plaintive wail of a Britisher to authorities of his government:

Sir:—The following points of danger deserve the earnest attention of those who value the safety of the British Empire:—

(1) We chiefly depend on outside sources for our food.

(2) Our sailing vessels and most of our steamers are of less speed than 12 knots. Most of these ships are likely to be on the ocean at the commencement of a naval war, laden with food, and raw material for manufactures. Many of these slow vessels are likely to be captured by the fast cruisers of our enemy.

(3) Our Mercantile Marine consists of 11,041 vessels, the United Kingdom owning 9,043 and our Colonies 1,998. Of the 11,041 vessels only 1,033 can steam at 12 knots, and of these only 85 have a speed of 16 knots and upwards. Our fastest vessels are the Campania and the Lucania, which have a speed of 22 knots. Germany possesses faster vessels, the Deutschland, 23½ knots; the Kaiser Wilhelm II., 23¼ knots; the Kronprinz Wilhelm, 23 knots; and the Kaiser Wilhelm der Grosse, 22½ knots. The Kaiser Friedrich, 22 knots, is as fast as our fastest.

(4) With 10,000 slow vessels laid up in port, or captured by our enemy, we should not possess sufficient shipping to supply our wants.

(5) The number of fast vessels we should be able to purchase abroad is likely to be small, as foreigners would require their vessels to supply their wants.

(6) A great reduction in the number of ships bringing us food must necessarily greatly increase the price of food in these islands.

(7) A considerable increase in the price of food would cause millions of our population to be almost destitute.

(8) The result of having a large starving population in these islands during a naval war, is likely to be, that, although our navy were victorious wherever it was able to meet the enemy, we should be compelled to submit to a humiliating peace.

(9) The greatest danger of all is that our Government may refuse until too late to have the matter inquired into.

Three times has an inquiry been asked for in the House of Commons, and on each occasion the Minister speaking for the Government has used arguments against an inquiry which would have been torn to tatters in the House, if our statesmen had given the question the attention it deserves.—Faithfully yours,

Thomas G. Read.

## CHEMICAL DEVICE TO PREVENT FIRES AT SEA.

Nothing which can happen on board a ship at sea causes such alarm and panic as the ever dreaded cry of "Fire." Though there are thousands of miles of water all around, and miles deep of ocean beneath the vessel, yet no fire on land can compare with the rapidity with which the great devouring element will work its sure destruction of the finest craft at sea. A doctor in England has devised a means which is believed to render fire at sea incapable of great disaster.

By his method the air in the ship's hold is rapidly mixed with a sufficient supply of a gas to make it efficient in arresting a heated condition, the gas being absolutely nonexplosive.

The apparatus consists of a fairly water-tight wooden box or trough, built on the floor of each hold, at the lowest point, and as near the center between the bulkheads as is convenient (in coal bunkers, at the bottom toward one side), and a small pipe leading from the deck to this trough. In coal ships, the thermometer tube may serve for the purpose, and when the ship is carrying a general cargo the tube may remain a permanent fixture. The trough is filled with a few tons of a material about one-half as bulky as coal. This, with some gallons of an easily stored liquid, comprises the entire outfit. The entire cost of fitting a ship with apparatus sufficient for charging the hold six times is estimated at $100. As the material does not deteriorate with age or exposure to the action of salt water, it may be carried for years, yet is always ready for use in case of emergency.

**The method of irrigating alfalfa fields is to flood at a depth of two or three inches after each cutting.**

# Highest Bridge in all the Americas

## Braced Arch Stretching Through Space Between Mountain Peaks in the Rugged Land of Volcanoes

In the land of the volcanoes, just 60 miles north of the route proposed for the Nicaragua canal, a bridge has recently been built that is marvelous in its bewildering height. It is the Pacific Railway bridge across the Rio Grande in Costa Rica. Stretching 685 feet between two precipitous mountain peaks it spans a canyon-like valley through which a torrent rolls 340 feet below. To a person standing on the water's edge a train crossing the bridge resembles the creeping of an insect. No bridge in all the United States is so high as this. It is higher than the roof height of the highest sky-scraper in the United States. Under its central arch the great Masonic Temple of Chicago or the St. Paul building of New York could stand and then there would be a clear space of more than 32 feet overhead. The material used in the superstructure all came from the United States, and the work of construction was done by New York and Chicago firms. The material was shipped from New York to Port Limon and then shipped by rail to the site and unloaded by steam derrick in a storage yard on the east side of the canyon. The field riveting was done with pneumatic hammers operated from a compressing plant supplied by the Chicago Pneumatic Tool Co., taking steam from a locomotive boiler. The Pacific Railway of Costa Rica is now being built to complete communication between the Atlantic and Pacific oceans.

The Railway Review in an exhaustive description of the great bridge occupying four pages, states:

"The structure is in three spans, the center one being a braced arch 448 ft. 8¼ ins. c. to c. of the skewback pins. The approach to this on each end of the bridge consists of a span 118 ft. 1½ in. long, made up of a cantilever arm 47 ft. 3 in. long, and a suspended span 70 ft. 10½ in. long, making the exact length of the bridge, from abutment to abutment, 684 ft. 11¼ in. The division of each shore span into a suspended span beyond the cantilever arm was to prevent the possibility of any hammering action at the abutments.

View of the Great Rio Grande Braced Arch Bridge From Underneath

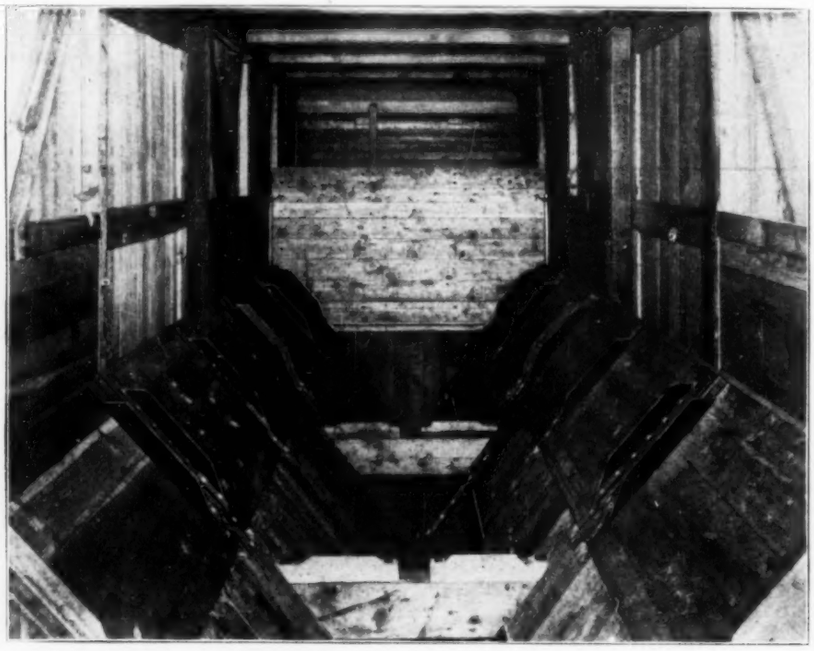
At the bridge site the banks of the canyon are almost vertical and consist of weathered shale. The excavations for foundations of the skewback piers were carried to sound rock.

## CAR WITH MECHANICAL BOTTOM

### A Lightning-Change Contrivance That Can Be Used for Either Coal or Grain.

A peculiarly constructed box car with a mechanical bottom that will discharge its load of coal in less than a minute has recently gone into service. It is so designed that it can be loaded as a hopper car in one direction with coal and the car changed at the end of the haul into a flat bottom, ordinary box car, and loaded back with grain, merchandise or other "non-dumpable" material. The Railway Review says:

"The unloading of the coal from the hopper of this car is easily accomplished by opening the lower hopper door by means of a lever with dog and ratchet, on the outside of the end of the car, as shown, such opening being made easily and quickly, the entire load being dumped in less than a minute."



Interior View When Used as a Dumping Car

## ALL PRAISE PROSPERITY.

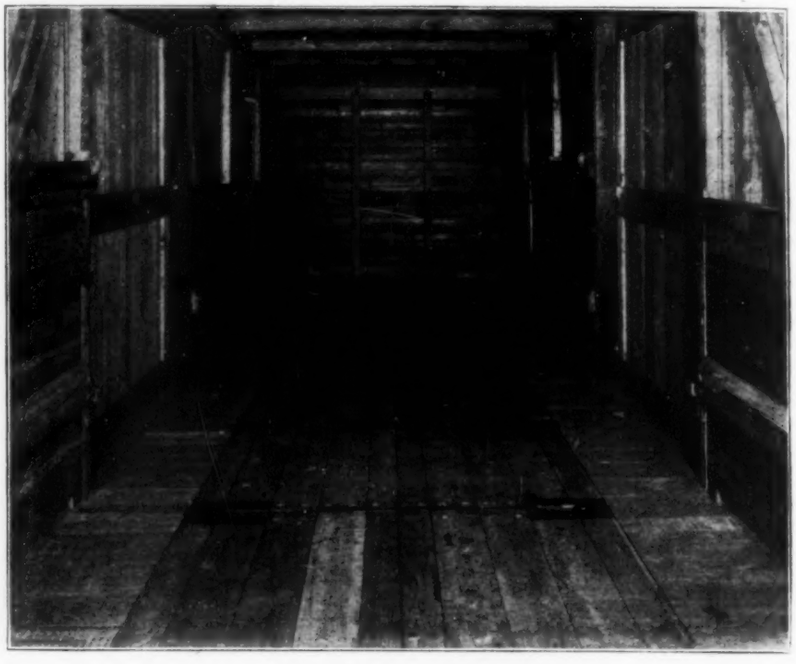
They raised his salary two years ago
last May,
The said increase amounting to thirty
cents a day;
Since then they've raised the prices
Of carrots and of beets,
Of flour and of meats,
Of corn and coal and fruits,
Of babies' little boots,
Of potatoes, milk and cheese,
Of the product of the bees,
Of hats and socks and coats,
Of all that sinks or floats.
He's paying out the money that he saved
before his raise,
But prosperity's upon us, and his heart is
full of praise.

The import of Russian oil in China and Japan has decreased while that of American oil has doubled.

## PAPER SLIPPERS FOR HOTEL GUESTS.

A queer improvement is being introduced in hotels in Europe, and if it succeeds in those that are trying it now, it is hoped that finally it will become universal. It is to furnish every guest on his arrival with slippers.

These slippers are made of paper. The soles are of pasteboard and the rest is made of white or brown paper, stitched with heavy cotton to prevent tearing. There are various qualities.



Interior View When Used as a Box Car

## NEWSPAPER BENEATH THE SEA LEVEL.

### Only One in the World and It Is Called the Coachella Submarine.

There is but one paper in the world printed below the level of the sea. That paper is the Coachella Submarine. It is a little four page weekly that is situated in the midst of the most formidable deserts in California—the Colorado desert. The paper recently moved to Coachella, from Indio, regarding which event the editor in the columns of the Submarine states:

"Inducements of a flattering character having been offered the publisher, in the way of a bonus, we have removed our printing office from Indio to Coachella, a distance of three and one-half miles. We have dropped from twenty-two feet below sea-level to seventy-six feet below sea-level.

"We hit Coachella with a dull yet raucus thud. The low rumbling noise you heard last Tuesday was caused by our printing office making the drop. It may be truly said that the Submarine is the lowest down, or the lowdownest, or the most low down newspaper on earth. As nearly as we can compute the distance, hades is about 212 feet just below our new office. The paper will continue to advocate the interests of all the country below sea-level, and we want you to fire in all the news you know."

At the outbreak of the war with Spain there was no such thing as a telegraph line in Cuba. There are now about 4,000 miles of telegraph wires uniting every town, city and station.

Extensive discoveries of iron ore have been made in Northern Norway near the Russian border.

No Chinaman, however rich or poor, will wear woolen clothing.

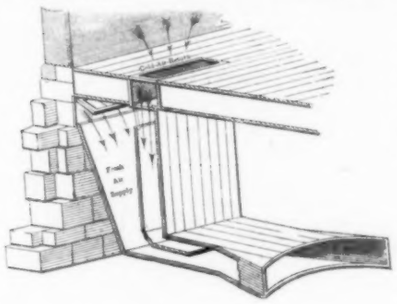
### THE LAST GREAT SCHEME OF TREVETHICK.

Trevethick, to whom may be due the locomotive we have today, was one of the most wonderful inventors that ever lived. At one time his income amounted to $250,000. But he was wildly extravagant, and his great failures ran away with his profits. One of his amazing schemes was a national memorial in London in honor of the passing of the reform bill. This was to take the form of a hollow cast iron pillar, 1,000 feet high. It was to be gilt all over and was to cost $400,000. But it was to prove a paying speculation, for up the central tube he designed an extraordinary lift, or elevator, to carry passengers. It was a sort of huge piston driven by compressed air. Trevethick thought that 1,000 passengers a day at 6 pence per head would return a fair interest upon the money. Two months later the unfortunate inventor died penniless at Dartford.

### SUCCESSFUL METHOD OF SUPPLYING AIR.

Saving fuel, and insuring successful and quick heating in extremely cold weather, the method of supplying air, now widely practiced in furnace heating and employed to its best advantages in the hot air furnace system of the Ilion, N. Y., public library building, commends itself to all students of ventilation. The method of connecting the air ducts is shown in the accompanying illustration. It will be seen that the air in the building can be kept in circulation when few people are in the library or in extremely cold weather, and that the supply by means of dampers can be taken conjointly or entirely from out of doors to freshen the atmosphere at will as may be necessary. When all the air is taken from outside there is a certainty of frequent changes of air in the building as the heated air cannot enter to keep up the temperature without a corresponding volume of fresh air. In this building the fireplaces continually remove a considerable body of air to make room for fresh air.

The Metal Worker states: "The registers are of the open Persian pattern. The air ducts leading from the outside are 16x40 inches, with an area of 640 square inches, and run across above the basement floor, connecting with the bottom of the furnace casing, with an opening 16x36 inches, having an area of 576 square inches, or ample to fill all of the heating pipes. The return air registers

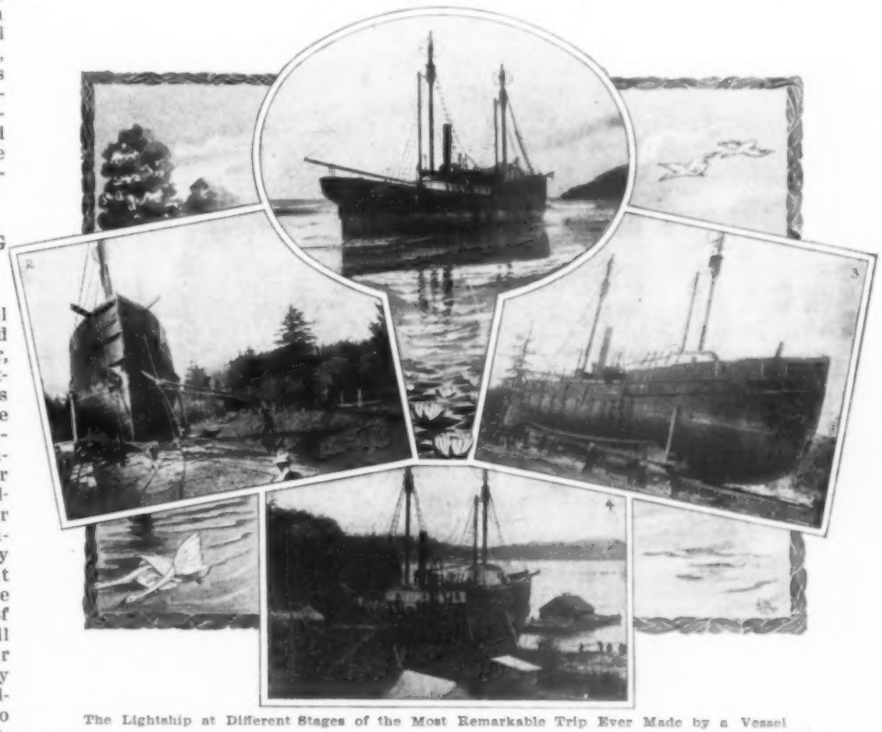


are 18x36 inches in size. Each furnace is connected with a smoke flue 12x12 inches in size by means of an 8-inch smoke pipe. With the mercury at 18 degrees below zero no difficulty has been experienced in keeping up a temperature of from 68 to 74 degrees.

## Stranded Ship Makes Trip of a Mile Overland

### Remarkable Performance of a Vessel that was Beached During a Terrific Gale

The only ship that ever made a trip of a mile overland is herewith shown in the various stages of its remarkable journey. It was the government lightship which was stationed at the mouth of the Columbus river. During a terrific gale the vessel was blown from its moorings and stranded on the beach a short distance to the north of the river's mouth. Several ineffectual attempts were made by professional wreckers to drag the ship back into deep water. A contract was finally made with a firm of housemovers at Portland, Ore., who took the vessel across the neck of land separating the Pacific ocean and Baker's Bay, where it was successfully launched, towed to Portland, repaired and returned to its former station, where it is now doing duty. The illustrations show the vessel at four different points on its trip. No. 1 is as it appeared lying in the sand on the beach. No. 2 shows it on its way across the peninsula. No. 3 shows the cradle and other gear used in making the move. In No. 4 is shown the vessel ready for launching in the bay after its trip of more than a mile overland.



The Lightship at Different Stages of the Most Remarkable Trip Ever Made by a Vessel

Within the last few years the raising of rice in Louisiana and Texas has developed into one of the leading industries of that region and given great value to lands, heretofore used for grazing, and to water which had been allowed to waste in the Gulf of Mexico.—Prof. Elwood Mead, expert in charge of irrigation investigation.

The Rock Island railroad is building a tunnel near Freeburg, Mo., and is using a steam shovel to load the pieces of rock into small push cars after each blast. The steam shovel is a small one and will scoop up a ton of rocks at a time.

About 6,000 miles of new steam railway were built in the United States last year, exclusive of side tracks and rebuilt mileage.

### WHY THEY SEE SNAKES.

#### Hallucinations of Intoxicated Persons Explained by Experiments.

Persons suffering from delirium tremens usually imagine they are surrounded by snakes. An explanation of this hallucination, says the Family Doctor (London), is offered by the result of some recent experiments. Sixteen alcoholic patients were examined with the ophthalmascope, and it was found that the minute blood vessels in the retina of the eyes were congested. In this condition they appear black and are projected into the field of vision where their movements resemble the squirming of serpents.

Just as soon as suspicion arises that irrigation development is being promoted for selfish purposes, the doom of irrigation will follow.—The Implement Age.

**Popular Mechanics**

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## TO MAKE ARTILLERY INVISIBLE.

An interesting experiment has been tried at Aldershot, England, in an attempt to render artillery inconspicuous against all kinds of backgrounds. Says The Electrical Age:

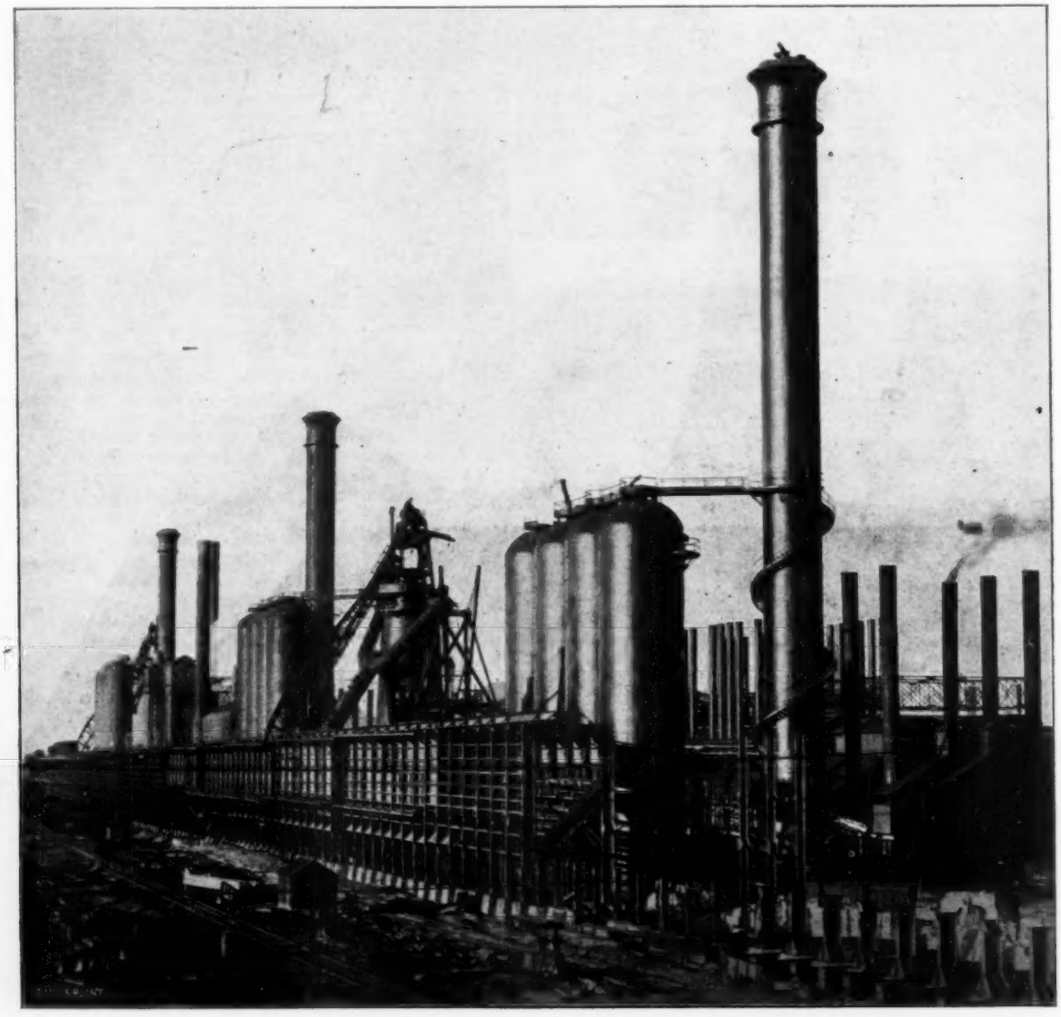
"A battery of six guns, with their timbers, was painted rainbow fashion, with streaks of red, blue, and yellow, the whole blending, at a little distance, into a confused mass that rendered each gun difficult to locate, whatever its surroundings might be. At 800 yards the outline of the gun is lost, while at 1,000 it harmonizes with trees, open grass land, sandy plains, or broken country. As a trial the guns were placed in position on the eastern slopes of the hills, and the artillery officers at Aldershot were invited to try and locate them from the western slope at a distance of about 3,000 yards. Although all knew the direction in which the guns were, none succeeded in finding them all, even with strong glasses. A section of the horse-artillery guns were sent forward to engage them so soon as they could discern them, and they actually advanced to within 1,000 yards before they were espied. At close quarters the guns present a most incongruous appearance, being a mass of daubs of color, but the idea is a decidedly practical one, nevertheless."

## ENORMOUS BLAST FURNACES IN COLORADO.

### Minnequa Steel Works a City of Giant Machines and Still Growing.

The low-pressure cylinder, large enough for a boy to ride through on a horse, described in a recent issue of Popular Mechanics, is only one of the numerous huge things that go to make up the great works of the Colorado Fuel & Iron Company. Camp and Plant, published at Pueblo, Colo., in the interest of the sociological department of the company, tells of the colossal blast furnaces at the Minnequa Steel Works.

The furnaces shown in the accompanying illustration will give but a small idea of the extent and colossal proportions of the works which are a city within themselves. They are being made even more extensive by vast improvements and extensions now nearing completion. Each of the furnaces herewith illustrated has an annual capacity of 215,000 tons. The line of furnaces is 1,760 feet in length. Each measures 20 by 95 feet



Blast Furnaces A, B, C, D and E, and Site For F, at Minnequa Steel Works

and is fitted with automatic skip hoists. There are four stoves to each furnace, 21 feet in diameter by 106 feet high. Each of the tall draft stacks is 12 feet 6 inches in diameter in the clear, by 210 feet high

On this page is shown the boilers for the new 40-inch blooming mill and merchant mill. The battery of boilers will generate 18,000 horse power.

Battery of Boilers for New Blooming Mill and Merchant Mill

## THE RICHEST CITY IN THE WORLD.

The richest city in Europe, and probably in the world, is Basel—or Basle as it used to appear in the school geographies—in Switzerland.

The returns published by the tax administrator show the assessed valuation is more than $175,000,000 and the total population is 124,000, an average of more than $1,400 for each man, woman and child in the city. The assessed valuation of Basel equals the total revenue of the 88,000 houses and buildings in Paris.

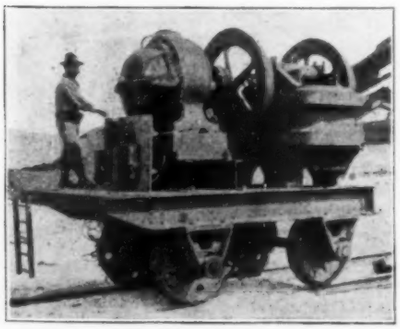
Of the 124,000 inhabitants of Basel, there are 180 who are rated as millionaires. Inasmuch as the amount is reckoned in francs, this means that the wealth of these 180 persons exceeds $200,000. There are 175 who have between $100,000 and $200,000, 170 who have $100,000, and 895 who have from $20,000 to $100,000.

Within fifteen years the wealth of Basel has increased $60,000,000, and the population has almost doubled, which is a most remarkable showing for a town that is 1,500 years old. It has always been famous. It was the important stronghold of Helvetias in the eleventh century and Erasmus died there in the sixteenth century.

The manufacture of silk ribbons is the chief industry, Basel producing more of these ribbons than any other city in Europe. Much machinery is also made there, and many chemicals.

## PORTABLE ELECTRIC ROCK CRUSHER.

One of the German railroads has adopted a novel arrangement for crushing rock for ballast about stations. An immense crushing machine has been securely mounted on a flat car, with an electric motor to run the crusher. When the crushed stone is needed, the car is sent to the station, and electric current conducted from the nearest electric wires by means of long wires, carefully insulated. When enough stone has been crushed the plant is put in a train and taken elsewhere. This saves the hauling of the ballast long distances as stone is abundant on the line.



German Rock Crusher

## FAIR PILOTS ON THE OHIO

### Women Who Have Gained Distinction Guiding Boats on the Famous Stream.

The occupation as pilot is becoming quite a fad among women along the Ohio river. Since an article on one of these fair navigators was published in a previous issue of Popular Mechanics similar licenses have been taken out by several others. Among the latest to obtain distinction in this novel feminine occupation might be mentioned Mrs. Emma Francis Golden, wife of Captain John Golden of Jeffersonville, Ind.; Mrs. Natural Miller of Louisville, Ky.; Mrs. A. B. French, whose husband owns a whole fleet of boats, and Mrs. Green of Wheeling. Mrs. Miller claims the distinction of being the first woman pilot on the Ohio. All of these women obtained their license by standing the strict examination required by the government examining board. It is rather remarkable that their grades averaged higher than those awarded the men.

Mrs. Golden went to piloting for her health. She was almost an invalid when she started and in four months she has gained perfect health. She was formerly pilot on the "Emma Francis," a boat named for her. Now she is in the pilot house of the "Shawnee," one of the handsomest boats on the Ohio. Mrs. French is the wife of Captain French, a well-known Ohio river skipper. Besides being an expert pilot, Mrs. French is noted as a social leader and possesses rare accomplishments as a vocalist, pianist and sketch artist. Old-time rivermen look upon it as strange that during the experiences of these women in directing the course of vessels not one of them has ever yet met with a serious accident.

There were 150,000 lace workers in Belgium in 1870. The number has now fallen to 47,000. The Belgian lace industry is slowly but surely dying out.

## SOFT WOODS OF NEW SOUTH WALES.

The New South Wales government statistician mentions several of the more useful of the soft and fancy woods of the state. They include the beech, which attains a height of 100 to 150 feet, with a diameter of three to five feet, giving a strong, white, close-grained and durable wood, easily worked, and greatly valued for decks of vessels, flooring, turnery and furniture making; the black bean, growing to a height of 120 to 130 feet, with a diameter of from four to five feet, with a handsome, close-grained, dark-colored, durable wood; the black oak, used for bullock yokes, tool handles, shingles, etc., and the blackwood, resembling walnut, and highly valued for making furniture.

Another valuable timber is the rosewood. It is strong-grained and durable, with a color resembling Spanish mahogany. Among other woods may be mentioned the silky oak, which attains a height of seventy to eighty feet. The color is a light gray, beautifully crossed with silvery waves, and when polished the surface has a delicate luster. Bedroom suites made from this wood possess a dainty appearance. Satinwood is another useful timber, yellow in color. It is soft and silky to the touch, close-grained, and easily wrought.

## MAY HAVE DISCOVERED VALUABLE SECRET.

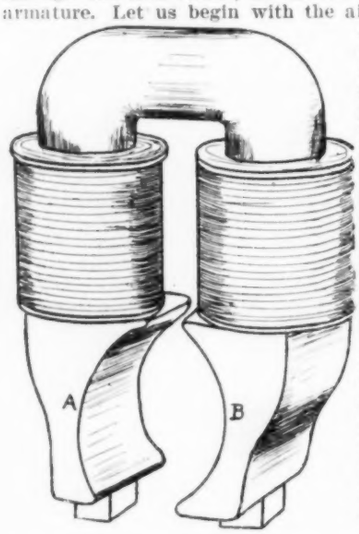
C. J. Rothermel of Stewartville, Minn., seems to have about discovered the long guarded secret of producing carbon paper. Noticing an article in Popular Mechanics to the effect that the method of manufacturing the paper was known to but a few people in the world and was an art handed down from father to son for generations past, Mr. Rothermel sent to Popular Mechanics a specimen of carbon paper he had made. In tests in Popular Mechanics' office it gave equal or better results than the carbon paper made for general use. If it can be manufactured as cheaply and will hold its coating as well Mr. Rothermel has undoubtedly made a valuable discovery.

# Easy Electrical Experiments

By L. P. Dickinson

## DESIGN OF A SMALL DYNAMO—PART III.

Final calculations must now be made to determine the size and amount of wire upon the field coils. The latter have to furnish enough magnetic force to send 156,240 magnetic lines through the iron frame, across the air gap and through the armature. Let us begin with the air gap between armature and field. It is 1-32 inch wide on each side of the armature. That is, the magnetism has to cross a layer of air equivalent to 1-16 inch thick. To calculate the ampere turns required for this, multiply the density of magnetism in the air gap (20,000) by the width of gap (1-16 inch) and by .313. This gives as a result 391. Next find how many ampere turns will be required for the field magnet. The total length of steel traversed, beginning at A and extending around to B is about 11 inches. Multiply this by the density (88,000) and by .313. This gives us 240,384. This would be the amphere turns required if steel were no better a conductor of magnetism than air. But as a matter of fact soft steel, under the above conditions, has a conductivity 800 times greater than air. So we will only need one eight-hundredth as many ampere turns as above calculated. This gives us 300 as the ampere turns required for field. For the armature teeth, which are 5-16 inch deep and of an average width of 5-16 inches, there will be needed 26 ampere-turns. And for the body of the armature core there will be needed 75 ampere turns. Adding these all together gives a total of 792 ampere turns. To this we will add 25 per cent. to make up for armature re-actions, giving a total of 990. We decided in the beginning (Chapter 1) that our field current should be ½ ampere. So we will need 1,980 turns of wire on our field magnet. We find the size of wire to be used in just the same way that we found the size in the armature—namely, by allowing 400 circular mils per ampere. This shows us that No. 27 magnet wire must be used. Calculating the length of 1,980 turns of No. 27, we find that it would take about 990 feet, and have a resistance of about 60 ohms when hot. Now this would give us a current of 1 1-5 amperes, which is too much. Our assumption of ½ ampere then was too high, and we cannot use No. 27 wire. Let us assume a field current of ¼ ampere. This would require 3,960 turns of No. 30 magnet wire, whose total length would be 1,980 feet, with a hot resistance of 210 ohms. This gives us the right value of current, assuming an e. m. f. of 52½ volts. The wire will be wound on the core in 14 layers on each spool of approximately 135 turns each.




The weight of wire required is about one pound.

The accompanying figure shows the finished field magnet with windings in place. The cores are first wound with several layers of heavy paper glued in place. Then four heavy split washers of cardboard or fuller board are slipped on the core, protecting the ends of the coils from contact with the iron. The wire should be wound evenly, and the two coils connected in the usual manner.

Castings similar to the above may be bought of dealers in electrical supplies, or may be made from patterns. If made of cast iron, however, the cross section will have to be doubled, and the field windings recalculated.

The armature of our dynamo is to be made up of a large number of discs, cut from thin sheet iron. These may also be bought of the form and dimensions given in a previous chapter. About 60 of them make a pile one inch high, so that 150 discs will be required.

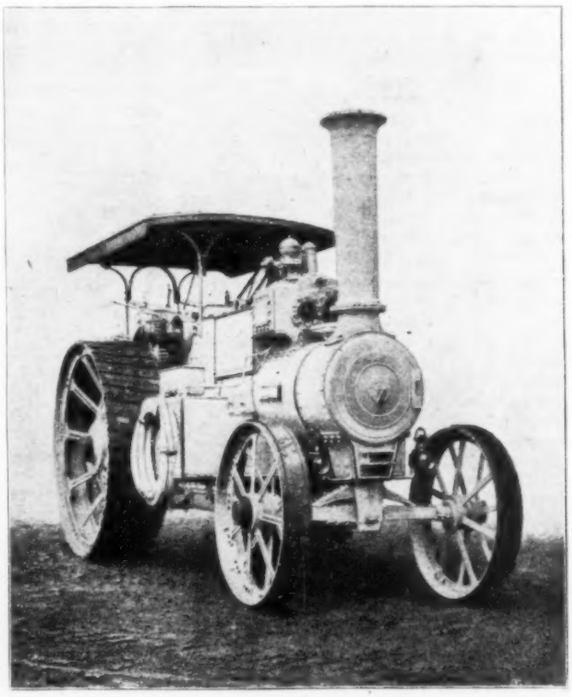
Directions will be given in the following chapter for winding the armature, building commutator, and finishing up the machine.

## ARTIFICIAL GRAPHITE.

In carrying out his experiments Mr. E. G. Acheson observed that by the direct passage of a heating current through a mass of coke, it was possible to free the coke of many of its impurities and to increase its conductivity to a marked degree. Later he discovered that carborundun and many other carbides might be directly transformed into graphite simply by volatilizing the non-carbon element. It followed almost as a matter of course that the conversion of carbon to graphite by any method of electrical heating, depended upon the presence in the carbon of carbide-producing elements. It likewise followed that the impurities should be present only in such quantities as to permit the progressive formation of the mass of coke into graphite, carbides being formed and decomposed, the volatilized non-carbon element combining with adjacent portions of the carbon. Mr. Acheson found that an artificial mixture of carbon with impurities was unnecessary, since non-coking coals and certain varieties of charcoal contain the proper minerals. As the present patent states, the original distribution of volatile impurities is important. For example, petroleum coke in the form of lumps and in rough admixtures of iron or iron ore, can be suitably heated in an electrical furnace, thereby causing the vapours of the metal so to permeate the entire mass as to determine its complete transformation into graphite.

## COMPOUND TRACTION ENGINE FOR SOUTH AFRICA.

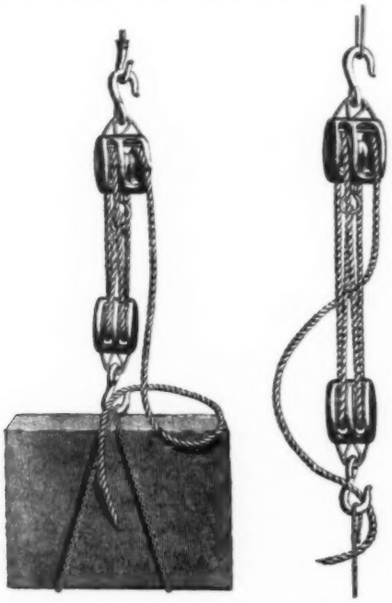
South Africa is becoming a target for manufacturers of the latest improved machinery. Here is a compound spring-mounted traction engine recently built in London for South African service. The engine is 10 nominal horsepower, having steam jacketed cylinders 7 inches and 11½ inches in diameter by 12-inch stroke, and the boiler is constructed for 175 pounds working pressure. The extreme length of the engine over all is 19 feet; the driving wheels are 70 inches in diameter by 24 inches wide. The engine is geared for two speeds—2½ and 4 miles per hour. The total weight is 15 tons and the water tank has a capacity of 400 gallons. A loose winding drum is provided which can pay out the rope when the engine is traveling forward.



Compound Traction Engine

## SELF LOCKING TACKLE BLOCK.

A self-locking tackle block is being put on the market. It will stop and lock automatically wherever needed, and



Tackle Blocks That Lock Themselves Automatically

can be used at any height. It will also work upside down, horizontally or at any angle. It is impossible for the rope, wire, or chain to slip when locked, and no lever or trigger-rope attachment is necessary or used. Only one rope or chain is used in hoisting or lowering. Any kind of rope, also chain or rope suitable to the size of block, may be used when desired. A pull on the hauling rope immediately releases the lock, and it is impossible for the rope to jam or chafe. There is nothing to get out of order. The device may be adapted to any size, single, double, triple, four-fold and five-fold blocks, thereby creating more uses for tackle blocks than were ever known before. Overhead tracks and trolleys can be fitted for easy handling of all heavy weights. By the use of the block one may hold all he can pull, as the rope can be locked at will, thus taking all the strain off the arms and giving the user an opportunity to rest whenever needed.

## IMITATION CELLULOID

A useful imitation celluloid is produced, according to a German method, by dissolving in 16 parts by weight of glacial acetic acid, 1.8 parts of nitrocellulose, and adding five parts of gelatine. Gentle heating and stirring are necessary. After the mass has swelled, it is mixed with 7.5 parts of 96 per cent of alcohol, with continued stirring. The syrup product is poured into moulds, or, after further dilution may be spread in thin layers on glass. As an underlay for sensitive photographic films, the material has important advantages, not the least being that it remains flat in developing.

**The depth of irrigation drainage must not be less than five or six feet, in order to be effective.**

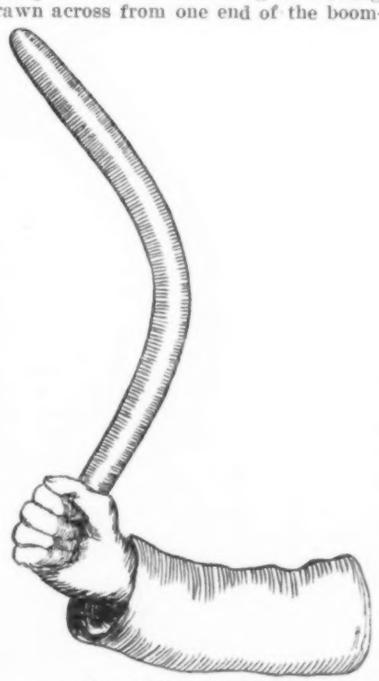
# How To Make and Throw a Boomerang

### Rare Accomplishment That Any Boy May Acquire with Practice

By S. J. Rawson, Champion Boomerang Thrower of the World

Boomerang throwing, which heretofore was supposed to be an attainment possessed only by the Australian bushmen, has been put on the stage as a vaudeville attraction. It is rare sport for the thrower and never fails to amuse no matter where exhibited. To make a boomerang that any boy can successfully handle, with the necessary amount of practice, take a piece of hard wood with the natural bend if possible and smooth it off to a flat surface on one side. Make the other side slightly round and whittle the wood down until it is about three-eighths of an inch thick at the thickest part. The edges should be cut down to the thickness of the back of the blade of a jackknife. The ends must be slightly pointed and the end that is not held in the hand should be slightly turned up, just as you might turn up the corner of a card.

If you cannot find a stick with a natural curve, get a piece of hickory or ash two and one-quarter inches square and from 28 to 30 inches long, and have it steamed and bent to the proper curve. This curve should be sufficient to make it about six inches from the inside of the bent place of the boomerang to a string drawn across from one end of the boom-

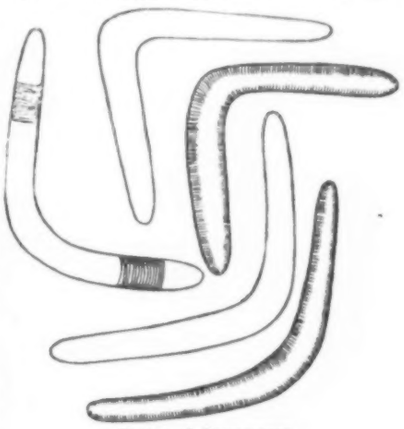


How to Hold a Boomerang

erang to the other. This should be whittled down the same as the naturally curved stick, so that it will be three-eighths of an inch thick at the center and gradually growing thinner toward the ends and sides.

In throwing the boomerang, grasp it firmly in the hand so near the end that the end is entirely hidden by the hand. Be certain to have the flat side of the boomerang next to the palm. In learning to throw, hold the boomerang horizontally, otherwise you will probably throw it into the ground. After you have become more proficient in the art you can hold it more perpendicularly when you make your cast. Throw with plenty of force.

It is excellent exercise and any boy



Shapes of Boomerangs

who will keep at it will soon be able to make it describe a complete circle.

## CHICAGO TO BEAUMONT BY WATER.

### Seemingly Impossible Feat Being Performed By a Beaumont Lumberman.

A journey from Chicago to the center of the Texas oil fields, all the way by water, and fresh water at that, except 90 miles! No such is not an impossibility; at least so declares William Weiss, of Beaumont, Texas, whose boat, "The John H. Kirby," is now making the remarkable journey. The Kirby was built in Chicago, towed down the Illinois and Michigan canal to the Mississippi river and thence to St. Louis, where her owner took charge of her, and with Mrs. Weiss, is now cruising about in the southern waters.

The Kirby will descend the Mississippi river to the Red river, go up the Red river for a distance of eight miles and then down the Atchafalya through beautiful Grand lake; crossing the lake she will again descend the Atchafayla to Vermillion bay; from there she will cruise the Gulf of Mexico for 90 miles, passing then through the Sabine pass and lake up the Neches river to Beaumont.

The Kirby is 97½ feet long and 17½ feet wide. The distance the boat will have traveled when it completes its voyage is 1,600 miles.

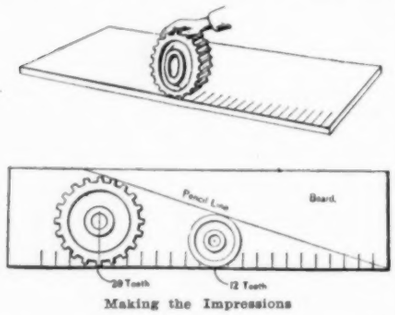
In casting iron around steel rods or shafts there should be a considerable body of cast iron surrounding the steel, says the Engineer, the steel rod should be heated before pouring on the iron, the temperature being raised to a point slightly below visible red; the surface of the steel rod should not be too smooth and should be roughened by small nicks cut with a cold chisel.

The average monthy production of gold at Cripple Creek, Col., exceeded $2,000,000 a month during 1902.

# SHOP NOTES

## SIMPLE SOLUTION OF A GEAR PROBLEM.

To find the proper size to turn up a gear blank, first get a soft pine board, say 2 feet long and 6 inches wide. Take a gear, say, with 12 teeth in it. Suppose you want to make a larger or smaller one. For instance, we will make

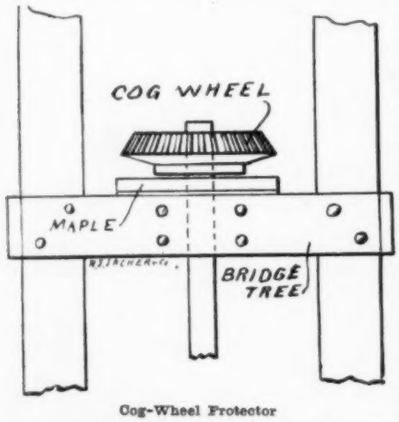



Making the Impressions

a gear with 20 teeth. To make these impressions in the board, roll the gear along the edge and press on it so it will make the marks of the teeth plain. Then count off the number you want. If your pattern gear has 12 teeth, count off 12; if you want to make a 20-tooth gear, count off 20 marks, then draw your line from the corner of the board to the size of the pattern gear. Machinists around cotton mills will find this very convenient, besides being very simple.

## COG-WHEEL PROTECTOR.

A short time ago I noticed that one of our water wheel steps was burning out, but as we were very busy I did not want to stop the mill, says a writer in the American Miller. I therefore put a piece




Cog-Wheel Protector

of hard maple between the bridgetree and the hub of the bevel gear, as shown in the sketch. We ran that way for two days.

As this was so successful I went to work and put a similar piece of maple under my other large gear. The step of that wheel went out in a short time, but the piece of maple saved the gear.

New England now makes but 6 per cent of the boots and shoes manufactured in this country.

## THE MAKING OF LIQUID AIR.

A great deal of nosense has been written about liquid air, principally in America. It was to be the power of the future. By its means power was to be obtained for nothing, and so on. In the lecture which he gave before the Cold Storage Association recently, Dr. Carl Linde, of Berlin, did good service in clearing away a good many misconceptions. It would not be economical to employ it in cold storage work, he explained, because when you only require a temperature a few degrees below the freezing point of water, it is not economical to produce a temperature 280 deg. F. below. Power has to be expended in producing cold, and the power is roughly proportional to the degree of cold produced. Liquid air in small quantities, the lecturer observed, would be very useful, say, for cooling dining or ball-rooms. In these cases the quantity of liquid air would be so small that the high price at which it was produced would not matter. Drawings were shown of apparatus by which rooms could be cooled in this way.

Liquid air is produced from ordinary atmospheric air, by a continuous process of compression and cooling. Every substance, it is supposed, may exist in one of three states, the solid, the liquid, or the gaseous, according to the surrounding conditions. Each state presupposes the presence of a certain quantity of heat in the substance. Thus in the solid form, a smaller quantity of heat is present, actually in the substance itself, than in the liquid form; and again a smaller quantity of heat is present in the liquid form than in the gaseous. The addition or the subtraction of heat from any substance, in sufficient quantities, will cause the substance to change its state. In addition, the three forms in which substances may exist, mean that the molecules, the very minute parts of the substances, are very much closer together in the solid form than in the liquid form, and in the liquid form they are much closer together than in the gaseous form. So that in order to liquefy a gas, two things are necessary, the closing up, as it were of its molecules, and the extraction of a certain quantity of heat from it. When air is compressed, as in those cases where compressed air is used for mechanical purposes, heat is generated in the air, in the act of compression. It represents a portion of the work done upon the air, by the compressor. And this heat has to be extracted, as well as the heat possessed by the air, in virtue of its condition as a gaseous mixture, before it can be liquefied. And so in the process of making liquid air, the air is continually compressed, by successive stages, and continuously cooled, a very pretty device being made use of in the cooling, by which the air which has been cooled to a certain degree, is made to cool air that has not reached that point, so that the effect is cumulative. When liquefaction is finally reached, the air in its liquid form looks exactly like water, and may be poured out just as water is—with certain precautions. The fact that liquid air is at the extremely low temperature named, makes it dangerous to handle, without precautions similar to those which are taken in handling hot bodies. With very cold bodies, heat passes from the hand, say to the object, at a very rapid rate, just as heat passes from a hot body to the hand, at a rapid rate. It is the rate at which the heat is transferred, either to or from the human body which causes the pain and other troubles. When poured out on a table the liquid air runs about in small globules, just as mercury does, and disappears in a very short time. It has returned to its gaseous form. When allowed to escape into the atmosphere, its presence is shown by clouds of mist, producing the impression that the liquid air is converted into fog. This is not so, however. What really happens is, the aqueous vapor which is always present in the atmosphere, particularly that of rooms in which a number of people are assembled, condenses, and then freezes, or forms a sort of hoar frost, and it is that we see, not the liquid air itself. Liquid air seizes every opportunity of returning to the gaseous condition, but it can only do so by extracting heat from surrounding bodies. When it is allowed to escape into the atmosphere, it extracts the heat from the air into which it passes, the atmospheric air of the room, in the immediate neighborhood of the orifice from which it is escaping. This lowers the temperature of the air at that point, and with lowered temperature it is no longer able to maintain so much aqueous vapor in suspension. The vapor is deposited as water, and then freezes. The same action, in a minor form, may be seen in any cold storage engine house, where the cold pipe is covered with snow.

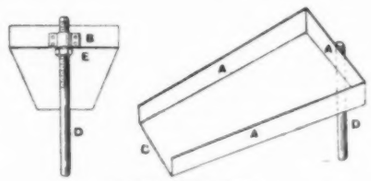
The method adopted for storing liquid air, devised by Professor Dewar, is one of the most novel arrangements that has been seen in the domain of physics for a long time. The air is stored in glass bottles, each bottle consisting of two distinct bottles, separated by a vacuum, maintained at as high a figure as it is possible to obtain. In addition, the outside of the outer bottle is silvered all over with mercury. The object of the arrangement is to prevent the access of heat to the liquid air inside the inner bottle. The vacuum space offers a very high resistance to the passage of heat waves through, or across it, and the mirror formed by the mercury on the outside of the outer bottle reflects the heat waves away from the bottle. The mouth of the bottle is left open to the atmosphere, and it was stated by Dr. Linde that a charge of liquid air would last for about fourteen days. During this time the charge is slowly disappearing by evaporation, by reconversion to the gaseous form, from the passage of heat to the liquid. Closed bottles cannot be used, as, it being impossible to exclude completely heat from the liquid air, the latter would be slowly changing into the gaseous state, and in so doing, creating a pressure within the bottle which no vessel could withstand, which would also resist the passage of heat through its walls. The final pressure was given by Dr. Linde as 12,000 pounds, per square inch, when all the liquid had returned to the gaseous form. This is the reason why steel bottles cannot be employed as they are for carbonic acid gas, ordinary compressed air, and so on.—Globe, London.

Popular Mechanics, "the want medium."

## TO PREVENT ASH DUST IN CLEANING FIRES.

When the ashes and clinkers are drawn from the ashpit of boilers fired by hand, the dust and gas thrown out are very unpleasant. A writer in the Engineer tells of a device easily made to prevent this.

The drawing presents a simple arrangement for preventing the promiscuous flying about of ash, etc., when fires




Anti-Ashdust Device

are cleaned. It can be made with very little trouble.

This device consists simply of boards lined with tin or sheet iron. The sides and back, a a a, are 4 inches high. The end B is a little wider than the furnace doors. The end C is not as wide, and is made to allow about one-third of the chute to enter the ashpit door. The iron rod D is made adjustable by the nut E, in order to raise or lower the end B to whatever height is desired.

To use the device, place the end C in the ashpit, raise the end B an inch or so higher than the dead plate, and keep it in position by the rod D and nut E. Close the opposite ashpit door entirely, and the damper partly. Then hoe the ashes from the grates, and let them slide into the ashpit by means of the chute.

It will be found that most of the dust will be drawn in through the doors of the ashpit and furnace. It is better to wet the ash in the pit rather than upon the fire room floor, and it is just as easily removed.

## CHEMIST A NECESSITY IN FOUNDRIES.

A chemist specially conversant in metallurgy is now essential in all well-conducted foundries. He has full charge of the cupolas and is expected to reduce the cost of melting to a minimum, to determine the best material for lining, to analyze all fuel and to see that nothing but that giving best results is used. He is required to analyze all iron melted and to make mixtures that will produce at the spout an iron of any desired quality, and to familiarize himself with analyses of all the various irons in the market.

When specifications are received for castings he is required to state definitely whether or not he can produce an iron having the characteristics called for therein; if so, the amount of various brands of iron required and cost of the mixture. To make all tests of tensile and transverse strength, deflection, etc., to see that the iron is at all times fully up to the requirements of the foundry, and to meet and overcome all trickery and ignorance of civil engineers in testing and construction of castings. He must know the shrinkage of various mixtures and be able to state from outlines on blue prints if castings can be made from required mixtures without undue strain, hardness or softness in any part. In addition to his responsibility for quality of iron he is required to see that facing, blacking, sand and all foundry supplies are fully up to the requirements of the foundry, that castings may not be lost from bad material.

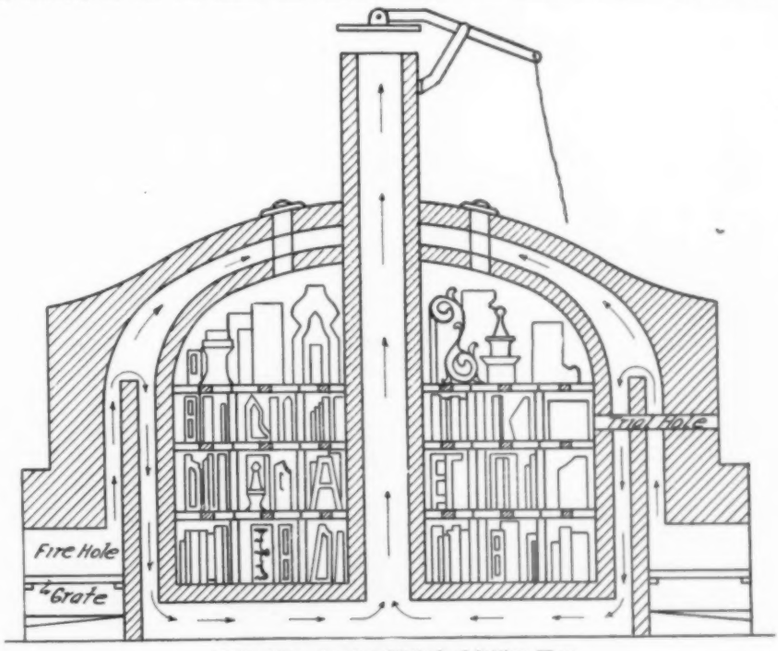
## TO REMOVE ACID STAINS FROM ENAMELED BATHTUB.

Acid finger stains on the enamel are not supposed to penetrate the surface, and may be treated with a solution of oxalic acid in water for a short time, then washed, and any final stain polished out by rubbing the surface with oxide of tin—the "tin putty" of the druggists—wet and applied on a wad of cotton cloth.—Metal Worker.

## A MUFFLE KILN.

Who has not wondered what was inside of those strange looking kilns which are seen in passing a terra cotta works? The beautiful and ornamental terra cotta pieces which have almost entirely taken the place of the more expensive and hand-cut stone, are made from selected clay, and pressed into shape in a mold. The piece is then dried in a room heated by steam, and baked or "burned" in a muffle kiln. The illustration from Brick gives an excellent idea of what the inside of these curious kilns look like.

The pieces are placed in tiers until the kiln is filled. Then the fires, of which there are several usualy, are started, and an intense heat secured. By means of the damper at the top of the kiln the fire can be regulated to maintain an even heat for many hours. When sufficiently burned the fires are allowed to go out, and the kiln cooled slowly. The arrows in the cut show the course




Muffle Kiln, Showing Method of Setting Ware

followed by the heat which is conducted beneath the kiln through many small tunnels. The "trial hole" is for observing and testing the progress of the burning.

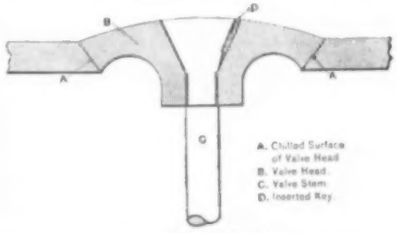
Extensive deposits of high-grade copper are known to exist in central Siberia, especially in the province of Kransnoyarsk.

## HINTS FOR INVENTORS.

The process of insulating cables, especially the lead covered, is one which is protected more by secrecy than patents. The demand is steadily increasing and will continue indefinitely.

## EXHAUST VALVE CONSTRUCTION IN GASOLINE AUTOS.

In a discussion of motor construction at the Mechanical Engineers' Institute in London, the designer of the Wolseley gasoline cars remarked that he had tried mild steel, nickel steel and cast iron for the heads of exhaust valves, but had found nothing equal to cast iron,




Automobile Exhaust

but it must be of very close grain and the seating face must be cast on a chill. To securely attach the head to the stem he had found a difficult matter, but he had finally devised the method shown in the accompanying sketch, says the Automobile Review.

The valve head is drilled with a tapered and tapped bore, as shown, and the valve stem is threaded correspondingly. The parts are put together after heating the head to a dull red, and the small key D is driven into the place prepared for it at the same time. To prevent the hot gases from impinging directly upon the inner edge of the valve he placed a small baffle plate at the edge of the exhaust post.

Santos Dumont's newest balloon will carry ten persons.

## MOST POWERFUL LIGHT IN THE WORLD.

**Lens Weighing Three Tons and Costing $12,000 Throws a Flash That is Blinding 20 Miles Away.**

The most powerful light in the world has been installed in the lighthouse on the Navesink Highlands, N. J. At 20 miles at sea in clear weather its glare is blinding, and the lighthouse department has a report from one ship captain who declares that he saw the flash 75 miles away. The Marine Journal, however, says that it is probable that this captain saw the reflection of the flash on the sky, for the Navesink tower is 246 feet above the level of the sea and the horizon is only 22½ miles from that point.

The light throws a flash every five seconds. The enormous power of the reflection is due to the new "bivalve" lens, this lens alone costing more than $12,000. The value of the bivalve lens is that each face throws an immense beam, concentrating the light rays that in the ordinary lens are dissipated by being shot to many angles. Instead of a cylinder of glass revolving around the light it consists of two great convex discs joined at the edges by thick brass bands. A bivalve lens of the fourth order will throw a flash of 5,000 candle-power from a light of only 250 candle-power.

The light at Navesink is so powerful that its illumination of the sea and sky can be seen from a distance many miles beyond the direct reach of its rays. The bivalve light, of course, must be revolved much more quickly than any cylindrical lens, and as a lens weighs from two to three tons, according to its class, the problem was a difficult one in practical mechanics, since all the lights of the country are revolved by clockwork. A system of chariot wheels mounted on steel ball-bearings has been perfected now that carries these great masses of ground glass so smoothly that the touch of a finger is sufficient to set them revolving. Once, as an experiment, a big third-order lens was set revolving in the lighthouse headquarters at Tompkinsville, S. I., by a man with powerful lungs, who blew it until it turned.

## PACKING HOUSE FOR CUBA.

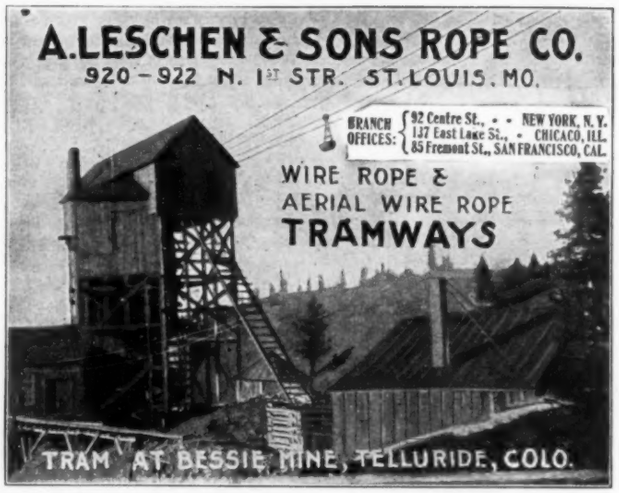
There is talk of building modern American packing houses in Porto Rico and Cuba. Such an industry, it is thought, could

Native Sheep

not be made to pay very handsome returns if supplied with the native stock. Porto Rican and Cuban cattle have been described in previous issues of Popular Mechanics. Here-

Razor Back Hogs

with are shown samples of the hogs and sheep. The negligent method of caring for the animals is believed to be largely responsible for their inferior condition. The sheep are small and the typical hog is the razor-back. The sheep folds are usually made of thatched straw and little effort is made to protect the sheep from unhealthful pasturage and infectious insects. The fences of the enclosures for all domestic animals are usually of the crudest and most unsubstantial construction.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## TO RECLAIM THE LAND OF GOSHEN.

**Region Famed in Biblical History to Be Made Verdant Again**

In the land of Goshen lying between the Nile and the Red sea, and famous in Biblical history as the region to which the Israelites were assigned by Pharaoh, the Egyptian government is now engaged in a gigantic reclamation project. Profiting by the example of enterprising private companies, says the Irrigation Age, the authorities have determined to reclaim an immense area which has long suffered from lack of sufficient moisture and which was, it was supposed, rendered utterly worthless by a canal dug by the engineers constructing the Suez canal for the purpose of supplying fresh water to the large force of workmen engaged in that undertaking. The canal was not carefully constructed and the seepage was of unusual proportions. Reaching the alkaline deposits which underlie the entire area, the water brought them to the surface in such quantities as to make the soil absolutely arid.

The government is now constructing two canals at different altitudes. One will suply fresh water for irrigation, and the other will carry away the alkali drawn off by the drains, which will be placed about four feet below the surface and 150 feet apart. During the first year it will be necessary to keep the surface saturated and no crop can be grown, but immense quantities of alkali will be washed out and into the Red sea. The second year a forage crop can be raised, and after that the usual crops of Egypt—corn, wheat and cotton—can be grown in great abundance. In the course of this work the surveyors discovered the well preserved remains of an irrigation canal, constructed by one of the Pharaohs, a description of which is to be found in Herodotus. The officers in charge are now working on the problem of restoring portions of the original aqueduct for present use.

An English engineer who has been making careful tests states that the loss of power caused by an average stop of a street car on an average road equals one-fourteenth that required to run a mile.

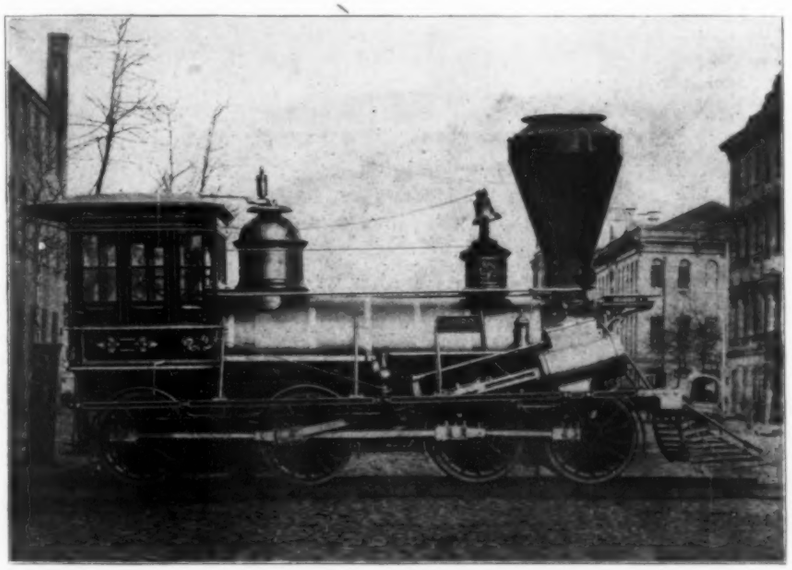
There are 1,470,000 persons in the United States over 10 years of age, besides 72,000 Indians, who cannot speak the English language. New York state has 220,000 and Arizona 27,000.

In Australia the dehorning of cattle is considered cruelty to animals.

## LOCOMOTIVES OF FORTY YEARS AGO.

Editor Popular Mechanics:—I have been much interested in the pictures you have published of old locomotives, but two types of locomotives much in use from 1858 to 1864, I have looked for in vain. They are, the one, the old inside connecting locomotive with a railing all around the boiler on the outside of a broad running board, and the other a Rogers locomotive with an angle iron for a running board. The inside connecting engine was used for passenger service and was from an artistic standpoint the most beautiful locomotive ever built. The engines of which I especially refer were used on the old Sandusky, Dayton and Cincinnati Railroad, and all the engineers were ambitious to be promoted to run one of them, but the passenger trains on all roads were at that time drawn by highly ornamented inside connecting locomotives and I would give a good deal to see a good picture of one of them now. It would give me and doubtless numerous other old timers, much pleasure if you would publish a good picture of those old inside connecting locomotives and also a picture of the Rogers engine with the angle iron running board.

Vinton Stillings,
Leavenworth, Kan.



A Type Now Nearly Forgotten

Herewith is shown a picture of a locomotive with outside angle iron frame making a broad running board extending the full length of the engine. This, however, is an outside connecting engine, but is the nearest likeness to the locomotive referred to that can be obtained at the present time. It is equipped with a Baldwin flexible beam truck which was patented in 1842. The engine here shown was constructed for a road in Cuba in 1861. It represents a type largely used for freight service from 1846 to 1886.

This engine weighed only 70,000 pounds, and the boiler was 48 inches in diameter. It contained 146 flues, 10 feet long, and 2¼ inches in diameter. The fire box was 56 inches long and 34 inches wide. The cylinders were 88x22 inches, and the wheel base was 18 feet and 10 inches. The photograph from which the illustration was made is supposed to be the only one in existence and was placed at the disposal of Popular Mechanics by the Baldwin Locomotive Company.

## THINGS OUR READERS WANT.

Where can I get a plaiting or braiding machine suitable for plaiting leather four strands? Geo. B. Hunford, Creighton, Neb.

John H. Roberts, West Homestead, Pa., is in the market for hardware novelties for a 5 and 10-cent counter, and also intends to handle gas mantles, burners, shades, etc.

Can you tell me where I can purchase automobile parts, suitable for constructing one myself? A. Jones, Box 441, Bellville, Ont., Can.

Where can I purchase screws in assorted sizes, by the gross, for scissors and shears?—B. L. Sperry, Guilford, Conn.

A. O. Jones, 1200 East Third street, Alton, Ill., desires to correspond with a view to securing desirable novelties to manufacture.

I would like to know the address of some firm that handles "Addis" spoons and gongs.—A. Garden, 430 Liberty street, Braddock, Pa.

I want a metal softer than lead, but not so soft it will not retain its shape.—George L. Starr, Otego, N. Y.

Please give the address of company which makes the "Cutgood half hatchets"; also makers of the Fulton hand saws.—E. L. Leib, R. F. D. No. 2, Bluffs, Ill.

I would like catalog and prices of new and second-hand motor bicycles and automobiles.—P. H. Simons, Box 174, Chaska, Neb.

I wish to get fine instruments for a mechanical draughtsman.—Frank Born, Dowagiac, Mich.

Can you inform me who manufacture spring singletrees for team work?—B. W. Swan, 1920 Myrtle street, Erie, Pa.

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## HE GOT THE JOB.

A characteristic story is told of Abe Gruber, the well-known New York lawyer. When he was a boy looking for something to do he saw a sign, "Boy Wanted" hanging outside a store in New York. He picked up the sign and entered the store. The proprietor met him. "What did you bring that sign in for?" asked the storekeeper.

"You won't need it any more," said Gruber, cheerfully. "I'm going to take the job."—Washington Post.


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## WOMEN RAILROAD WORKERS.

In France there are 15,319 women employed as gatekeepers at the railroad crossings. They get a very small salary, but the railroads provide each one with a house and a small garden patch rent free.

These women work every day in the year. They may not leave their posts for a day off even on Sundays and holidays, and their working days are from fifteen to eighteen hours long.

Five thousand two hundred and seventy-five of these women earn not more than $2.90 a month; 7,700 receive from that sum up to $4.80; 1,680 get from $4.82 to $7.72, and 601 from $7.91 to $10.61. Only 60 women get higher wages than this, and none get more than $31.84 a month.

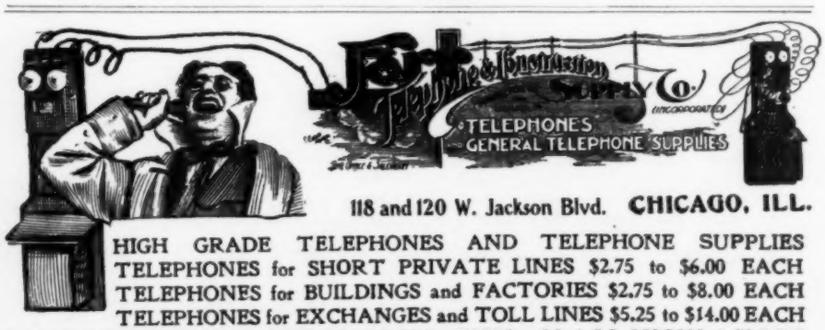
## HOW THE PINEAPPLE GROWS.

Many persons have a notion that the pineapple grows on a tree. It does not. The plant reaches a hight of only four feet, to the tip of the leaves. It comes out of the ground as a stalk, but divides at once into sword-like leaves, fifteen in number, from the center of which projects a stiff, upright stem, and at the top of this stem grows the fruit. The stem is short, and the crown of the fruit, when full grown is a foot or more below the tips of the leaves. Each plant produces a single "apple," but when that is pulled a little sucker appears on the stem among the leaves, and this becomes the head of the plant, and within a year produces another apple. This may go on for years.

A Pineapple Field

## LARGEST BLOCK OF MAHOGANY EVER IMPORTED.

A huge block of African mahogany, containing 37,000 superficial feet, board measure—the largest block of this wood ever imported into the United States—has been received by a furniture manufacturer in Baltimore, Md. Cut from a tree in the interior of Africa, 800 miles from the west coast, it was hauled through miles of swamp-lands by elephants and floated down a river to the coast where it was loaded on a steamer. It was then shipped to Baltimore by way of Liverpool. The block is 30½ feet long, and each of its four sides has a fall of 40 inches. It is considered exceptionally valuable, not only because of its rare quality, but on account of the exceptional length and breadth of the timber.



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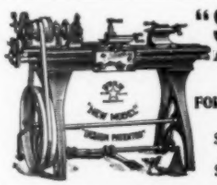

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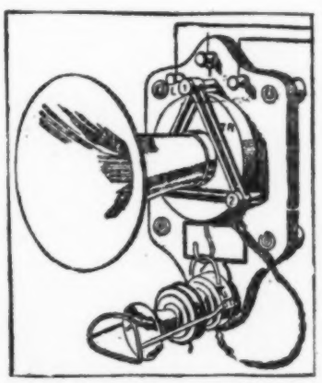
## NEW TYPESETTING MACHINE.

Oliver M. Gilmer of St. Joseph, Mo., candidate for congress, has invented a typesetting machine which, he says, will eliminate completely the complicated mechanism now employed in the Linotype machine. Instead of assembling lines of type or matrices, the depression of the keys makes corresponding impressions in a specially prepared stereotyping paper.

## TELEPHONE THAT TALKS ALOUD.

### No Use in Putting the Receiver to Your Ear to Hear With This Instrument.

A loud-sounding telephone system has been recently invented in France. It has been given a number of public tests at the office of Mr. Ducrete, a well-known engineer in Paris, who is responsible for the instrument. When the transmitter is spoken into in an ordinary tone the words can be plainly heard at the receiver end by one standing fifteen or twenty feet from the instrument. On the other hand, if one takes up a position close to the instrument the slightest noises, like



LOUD-SOUNDING TELEPHONE.

the ticking of a watch, can be distinctly heard.

As the instrument is at present constructed it is designed merely for short lines, connecting the various rooms of a building or some such similar service. Its most valuable place will be in maintaining a connection between the office of a factory and a noisy workshop. There is no call bell used, as it is said to be unnecessary. A person desiring to converse with another simply walks up to the telephone and calls whomever he may wish to talk with. This call made in ordinary tones can be heard over quite a large room at the receiver end.

## NEVER DROWNED BUT ONCE.

"He crossed the Atlantic twinty-siven times an' niver got drownded but wanst."

"Indade. An' which one of his trips was it he was drowned on?"

"Oi'm not shure, but I think it was the twinty-siventh."

"He was lucky. Manny a man would have wint to the bottom on his first v'yage instead of waitin' till the last."

"Right ye are. More people are drownded by water than by railroad wrecks."

"It's a fatal death, begorra."

## ELECTRICITY DIRECT FROM COAL.

Scores of chemists and electricians, some of the most prominent and many who are young and inexperienced are all working quietly and unknown on that problem of converting the energy in coal into electricty by some direct method. For the successful one, if success there eventually be, there is wealth and a lasting name. Edison has spent considerable time on the problem, thus far without success, but has hopes he will yet discover the secret. Perhaps this is one of the things he means to do in the two years he has started on in which he says he will devote his entire time to experimental work.

Mr. Swinbourne, a leading scientist and president of the British Institution of Electrical Engineers, recently stated in public his belief that it was impossible to produce electricity direct from coal in the electrolytic cell. Others in his own and other countries, equally prominent, insist it can be done.

The Engineer says:—The principal difficulty in the way of a successful electrolytic cell for consuming carbon is that carbon is unlike the metals in that it will not, so far as known, dissolve in any electrolyte. Metal, dissolving, replaces the positive ion of the electrolyte, which is thereby made free in the form of a gas, and escapes.

The majority of the efforts to produce a carbon cell have been wrong in principle. According to Ostwald, a high authority on chemistry, "the proper method for constructing a carbon cell is that it should have the oxidizing agent where the carbon is not." This is to insure that the action shall be electrolytic and not chemical, that the energy developed shall be electrical and not thermal, and also that the action shall continue only so long as the outside circuit is closed, allowing the passage of the current.

Our present method of converting the heat equivalent of the oxidation of coal into electrical energy is exceedingly wasteful, and the worst feature of the matter is that there is seemingly no hope of any very great improvement along old lines. If we had an efficient method of converting the heat equivalent of carbon into electrical energy directly, as we have of converting the latent energy of the oxidation of zinc into electricity in the ordinary galvanic battery, we could get ten times as much power from the same coal as we are now obtaining; and when we remember that one-half of the coal used in this country is being burned in furnaces of steam boilers for generating power, we can begin to realize, especially in the present coal shortage, what an invention of this kind would mean to the world.

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